CLAIMS

What is claimed is:

1. A method of communicating over a high-throughput communication channel comprising:

transmitting a channelization field as part of a current data unit, the channelization field indicating a frequency and space configuration of subsequent portions of the current data unit; and

transmitting a high-throughput training field in accordance with the frequency and space configuration indicated in the channelization field, the high-throughput training field to be used by a receiving station to estimate a channel matrix of the high-throughput communication channel.

2. The method of claim 1 wherein the channelization field indicates whether the high-throughput communication channel comprises one of:

a wideband channel having up to four frequency separated subchannels;

a multiple-input-multiple-output (MIMO) channel comprising a single subchannel having up to four spatial subchannels with up to four distinct data streams transmitted thereon; and

a wideband-MIMO channel comprising two or more frequency separated subchannels wherein each subchannel has two or more spatial channels.

3. The method of claim 2 wherein the wideband channel has a wideband channel bandwidth of up to 80 MHz and comprises up to four of the subchannels,

wherein the subchannels are non-overlapping orthogonal frequency division multiplexed channels,

wherein each subchannel has a subchannel bandwidth of approximately 20 MHz and comprises a plurality of orthogonal subcarriers, and

wherein the spatial channels are non-orthogonal frequency channels associated with one of the subchannels whose orthogonality is achieved by beamforming.

4. The method of claim 2 wherein the spatial channels are generated with a plurality of transmit antennas of a transmitting station performing the transmitting, each spatial channel carrying a separate data portion of a data unit comprising an orthogonal frequency-division multiplexed symbol.

5. The method of claim 2 wherein each subchannel comprises a plurality of orthogonal frequency division multiplexed subcarriers, and

wherein each orthogonal frequency division multiplexed subcarrier has a null at substantially a center frequency of the other subcarriers to achieve substantial orthogonality between the subcarriers of the associated subchannel.

6. The method of claim 2 wherein the channelization field is transmitted on a compatibility channel, the compatibility channel comprising a single subchannel with one or more spatial channels; and

wherein the transmitting the channelization field comprises transmitting the channelization field on the compatibility channel with a rotated binary phase shift keying (BPSK) modulation of subcarriers of the compatibility channel.

7. The method of claim 6 wherein the rotated BPSK modulation comprises phase shifting RF signals by substantially either +90 or -90 degrees in response to bits of a digital bit stream representing data comprising the channelization field.

8. The method of claim 6 wherein the rotated BPSK modulation comprises rotating a symbol constellation representing data comprising the channelization field substantially by either +90 or -90 degrees from symbol constellation of conventional BPSK modulation.

9. The method of claim 6 further comprising encoding a digital bit stream representing data comprising the channelization field with a code rate of ½ prior to rotating the BPSK modulation and transmitting the channelization field of the current data unit.

10. The method of claim 2 wherein transmitting the channelization field comprises transmitting:

a channelization mask to indicate which subchannels are used when transmitting subsequent portions of the current data unit;

transmit antenna bits to indicate a number of transmit antennas used when transmitting the subsequent portions of the current data unit;

spatial channel bits to indicate a number of spatial channels used when transmitting the subsequent portions of the current data unit;

a high-throughput training type bit to indicate whether the wideband or the MIMO channel is to be estimated; and

a header modulation bit to indicate a modulation type used for a subsequently transmitted field of the current data unit.

11. The method of claim 1 further comprising a physical layer convergence protocol (PLCP) header field after the channelization field modulated in accordance with a modulation type indicated in the channelization field,

wherein the PLCP header field comprises a mask to indicate fields of the PLCP header field, the fields including at least some of: a bit-loading per subchannel, a coding rate, a length, a transmit power level, an available transmit power level, a frequency channelization request, a number of spatial channels request, a bit loading subchannel request, a power loading per subchannel request, a coding rate request, a transmit power request, and a duration recommendation.

12. A transmitter comprising:

RF circuitry to transmit a channelization field on a compatibility subchannel; and

modulators to modulate a digital bit stream representing the channelization field with a rotated binary phase shift keying (BPSK) modulation of subcarriers of the compatibility channel,

wherein the channelization field is part of a current data unit and indicates a frequency and space configuration of subsequent portions of the current data unit.

13. The transmitter of claim 12 wherein the channelization field indicates whether the high-throughput communication channel comprises one of:

a wideband channel having up to four frequency separated subchannels;

a MIMO channel comprising a single subchannel having up to four spatial subchannels, with up to four distinct data streams transmitted thereon; and

a wideband-MIMO channel comprising two or more frequency separated subchannels wherein each subchannel has two or more spatial channels.

14. The transmitter of claim 13 wherein the wideband channel has a wideband channel bandwidth of up to 80 MHz and comprises up to four of the subchannels,

wherein the subchannels are non-overlapping orthogonal frequency division multiplexed channels,

wherein each subchannel has a subchannel bandwidth of approximately 20 MHz and comprises a plurality of orthogonal subcarriers, and

wherein the spatial channels are non-orthogonal frequency channels associated with one of the subchannels whose orthogonality is achieved by beamforming.

15. The transmitter of claim 13 wherein the spatial channels are generated with a plurality of transmit antennas of a transmitting station performing the transmitting, and

wherein each spatial channel carries a separate data portion of a data unit comprising an orthogonal frequency division multiplexed symbol.

16. The transmitter of claim 13 wherein each subchannel comprises a plurality of orthogonal frequency division multiplexed subcarriers, and

wherein each orthogonal frequency division multiplexed subcarrier has a null at substantially a center frequency of the other subcarriers to achieve substantial orthogonality between the subcarriers of the associated subchannel.

17. The transmitter of claim 13 wherein the rotated BPSK modulation is generated by the modulator, the modulator to phase shift RF signals by substantially either +90 or -90 degrees in response to bits of a digital bit stream representing data comprising the channelization field.

18. The transmitter of claim 13 wherein the rotated BPSK modulation is generated by the modulator, the modulator to rotate a symbol constellation representing data comprising the channelization field substantially by either +90 or -90 degrees from symbol constellation of conventional BPSK modulation.

19. The transmitter of claim 13 further comprising an encoder to encode a digital bit stream representing data comprising the channelization field with a code rate of ½ prior to the modulator to rotate the BPSK modulation.

20. The transmitter of claim 13 wherein the channelization field comprises:

a channelization mask to indicate which subchannels are used when transmitting subsequent portions of the current data unit;

transmit antenna bits to indicate a number of transmit antennas used when transmitting the subsequent portions of the current data unit;

spatial channel bits to indicate a number of spatial channels used when transmitting the subsequent portions of the current data unit;

a high-throughput training type bit to indicate whether the wideband or the MIMO channel is to be estimated; and

a header modulation bit to indicate a modulation type used for a subsequently transmitted field of the current data unit.

21. The transmitter of claim 13 wherein the RF circuitry further transmits a physical layer convergence protocol (PLCP) header field after the channelization field modulated by the modulators in accordance with a modulation type indicated in the channelization field,

wherein the PLCP header field comprises a mask to indicate fields of the PLCP header field, the fields including at least some of: a bit-loading per subchannel, a coding rate, a length, a transmit power level, an available transmit power level, a frequency channelization request, a number of spatial channels request, a bit loading subchannel request, a power loading per subchannel request, a coding rate request, a transmit power request, and a duration recommendation.

22. A frame structure for a data unit comprising:

a channelization field to indicate a frequency and space configuration of subsequent portions of the current data unit; and

a high-throughput training field in accordance with the frequency and space configuration indicated in the channelization field, the high-throughput training field to be used by a receiving station to estimate a channel matrix of the high-throughput communication channel.

23. The frame structure of claim 22 wherein the channelization field indicates whether the high-throughput communication channel comprises one of:

a wideband channel having up to four frequency separated subchannels;

a MIMO channel comprising a single subchannel having up to four spatial subchannels, with up to four distinct data streams transmitted thereon; and

a wideband-MIMO channel comprising two or more frequency separated subchannels wherein each subchannel has two or more spatial channels.

24. The frame structure of claim 23 wherein the channelization field comprises a rotated binary phase shift keying (BPSK) modulation of subcarriers of a compatibility channel, and

wherein the channelization field comprises:

a channelization mask to indicate which subchannels are used when transmitting subsequent portions of the current data unit;

transmit antenna bits to indicate a number of transmit antennas used when transmitting the subsequent portions of the current data unit;

spatial channel bits to indicate a number of spatial channels used when transmitting the subsequent portions of the current data unit;

a high-throughput training type bit to indicate whether the wideband or the MIMO channel is to be estimated; and

a header modulation bit to indicate a modulation type used for a subsequently transmitted field of the current data unit.

25. The frame structure of claim 23 further comprising a header field comprising a mask to indicate fields of the header field, the fields including at least some of: a bit-loading per subchannel, a coding rate, a length, a transmit power level, an available transmit power level, a frequency channelization request, a number of spatial channels request, a bit loading subchannel request, a power loading per subchannel request, a coding rate request, a transmit power request, and a duration recommendation.

26. A system comprising:

one or more substantially omnidirectional antennas; and

a transmitter comprising RF circuitry to transmit a channelization field on a compatibility subchannel using the antennas, and modulators to modulate a digital bit stream representing the channelization field with a rotated binary phase shift keying (BPSK) modulation of subcarriers of the compatibility channel,

wherein the channelization field is part of a current data unit to indicate a frequency and space configuration of subsequent portions of the current data unit.

27. The system of claim 26 wherein the channelization field indicates whether the high-throughput communication channel comprises one of:

a wideband channel having up to four frequency separated subchannels;

a MIMO channel comprising a single subchannel having up to four spatial subchannels, with up to four distinct data streams transmitted thereon; and

a wideband-MIMO channel comprising two or more frequency separated subchannels wherein each subchannel has two or more spatial channels,

and wherein the wideband channel has a wideband channel bandwidth and comprises up to four of the subchannels, wherein the subchannels are non-overlapping orthogonal frequency division multiplexed channels, wherein each subchannel has a subchannel bandwidth and comprises a plurality of orthogonal subcarriers, and wherein the spatial channels are non-orthogonal channels associated with one of the subchannels whose orthogonality is achieved by beamforming,

wherein the spatial channels are generated with the at least two antennas, and

wherein each spatial channel carries a separate data portion of a data unit comprising an orthogonal frequency division multiplexed symbol.

28. The system of claim 26 wherein the transmitter further comprises a beamformer to apply beamforming coefficients when transmitting the channelization field to increase a signal to noise ratio of signals received by a receiving station.

29. A machine-readable medium that provides instructions, which when executed by one or more processors, cause the processors to perform operations comprising:

generating a channelization field as part of a current data unit, the channelization field indicating a frequency and space configuration of subsequent portions of the current data unit; and

generating a high-throughput training field in accordance with the frequency and space configuration indicated in the channelization field, the high-throughput training field to be used by a receiving station to estimate a channel matrix of the high-throughput communication channel.

30. The machine-readable medium of claim 29 wherein the instructions, when further executed by one or more of the processors cause the processors to perform operations further comprising generating the channelization field to indicate whether the high-throughput communication channel comprises one of:

a wideband channel having up to four frequency separated subchannels;

a MIMO channel comprising a single subchannel having up to four spatial subchannels, with up to four distinct data streams transmitted thereon; and

a wideband-MIMO channel comprising two or more frequency separated subchannels wherein each subchannel has two or more spatial channels.

31. The machine-readable medium of claim 28 wherein the instructions, when further executed by one or more of the processors cause the processors to perform operations further comprising generating the channelization field for transmission on a compatibility channel, the compatibility channel comprising a single subchannel, and

wherein the generating the channelization field comprises rotating a binary phase shift keying (BPSK) modulation of subcarriers of the compatibility channel.

32. A method of communicating over a high-throughput communication channel comprising:

transmitting a channelization field and a high-throughput training field as part of a current data unit, the channelization field indicating a frequency and space configuration of subsequent portions of the current data unit, the high-throughput training field being in accordance with the frequency and space configuration indicated in the channelization field, the high-throughput training field to be used by a receiving station to estimate a channel matrix of the high-throughput communication channel.

33. The method of claim 32 wherein the channelization field indicates whether the high-throughput communication channel comprises one of:

a wideband channel having up to four frequency separated subchannels;

a multiple-input-multiple-output (MIMO) channel comprising a single subchannel having up to four spatial subchannels with up to four distinct data streams transmitted thereon; and

a wideband-MIMO channel comprising two or more frequency separated subchannels wherein each subchannel has two or more spatial channels.

34. The method of claim 33 wherein the spatial channels are generated with a plurality of transmit antennas of a transmitting station performing the transmitting, each spatial channel carrying a separate data portion of a data unit comprising an orthogonal frequency-division multiplexed symbol,

wherein each subchannel comprises a plurality of orthogonal frequency division multiplexed subcarriers, and

wherein each orthogonal frequency division multiplexed subcarrier has a null at substantially a center frequency of the other subcarriers to achieve substantial orthogonality between the subcarriers of the associated subchannel.

35. The method of claim 34 wherein the channelization field is transmitted on a compatibility channel, the compatibility channel comprising a single subchannel with one or more spatial channels; and

wherein the transmitting the channelization field comprises transmitting the channelization field on the compatibility channel with a rotated binary phase shift keying (BPSK) modulation of subcarriers of the compatibility channel.

36. The method of claim 34 wherein transmitting comprises:

first transmitting the channelization field as part of the current data unit; and

secondly transmitting the high-throughput training field as part of the current data unit.

37. The method of claim 34 wherein transmitting comprises transmitting the channelization field and the high-throughput training field as part of a single transmission of the current data unit.